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Patentanmeldung Nr. Patent application No. Demande de brevet n°

98305436.2

PRIORITY DOCUMENT

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Blatt 2 der Bescheinigung
Sheet 2 of the certificate
Page 2 de l'attestation

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PRINTED IMAGE WITH RELATED SOUND

Field of the Invention

The present invention relates to a system for the provision of images with related sound. In particular, the present invention relates to the provision of a still image, particularly a printed image, together with a passage of sound attached to the still image, and to the recording of such image and sound combinations, and to the playback of sound passages, and to methods and systems therefor.

Discussion of Prior Art

There are a number of widely used media (films, video) for provision of sound and images together in a concurrent continuous way, but there has been less success in the provision together of still images with associated passages of sound. This is despite the fact that this has been identified as a desirable combination for at least forty years. An early solution was the Synchrosheet technology, developed by Tokyo Denki KKK, the Tokyo Institute of Technology, the Dai Nippon Printing Company and the Canon Camera Company. This technology is described in an article by Yasushi Hoshino entitled "The Talking Book" in The Penrose Annual, Lund Humphries, London, 1959. This technology involved use of a paper sheet coated with magnetic film on which sound was recorded in spiral tracks using magnetic recording heads. A large and relatively complex reader was required to read the sound tracks.

Alternative approaches have been adopted in subsequent work. US Patents Nos. 4,270,853 and 4,270,854 both relate to instant printing cameras which also record a magnetic strip at a marginal portion of the film for recording sound. European Patent Application Publication No. 0670555 A1 and US Patent No. 4983996 both relate to sound storage appended to images by optical means: in the former case, by a dot code, and in the latter case, by a bar code. US Patent No. 5128700 also teaches the use of a bar code in this context, but here the bar code does not itself contain the sound information: the bar code merely contains a reference to sound stored on another medium, so that a sound reader can determine the reference from the

bar code and play the referenced passage of sound from a dedicated sound storage medium. US Patent 5,276,472 also teaches use of bar codes on a photographic print as a sound storage medium, and further suggests features of relief (blister marks) as an alternative. US Patent 4,905,029 discusses the idea of using "acoustic recording media" associated with photographic images to store related sound - alternatives involving chip storage are discussed also but these are stated to be "not currently practical".

A more complex approach to this design space is found in the "Video Postcard" idea of Philips Electronics N.V., disclosed on World Wide Web site http://www-eur.philips.com/design/vof/vofsite7/postcard/index.htm. This proposal concerns a piece of film with an embedded chip which stores a sound and video clip. The image display provision within the "Video Postcard" is thus specific and complex, unlike a conventional printed image.

Despite such a long standing interest in the possibility of provision of still images together with relevant passages of sound, no technology has been satisfactorily commercialised for this purpose. There is thus a need for technology which achieves provision of passages of sound with still images such that the sound and images together are cheap and convenient to produce, that playback of the sound is cheap and easy to accomplish, and so that both image and sound can be rendered at sufficiently high quality to satisfy a user.

Summary of Invention

Accordingly, the invention provides a system for presentation of an image and related sound, comprising: a printed image; an electronic storage device attached to the printed image and adapted to store information defining a passage of sound; and a sound reproduction device, comprising means to provide a connection with the sound storage device to enable information stored in the electronic storage device to be transferred to the sound reproduction device, and means to convert the information received from the electronic storage device into the passage of sound; wherein the sound reproduction device is adapted to be detachable or otherwise remote from the printed image when no connection between the electronic storage device and the sound reproduction device is required.

With this combination of features, a cheap, robust and effective mechanism is provided for sound storage together with printed images, allowing effective commercialisation of this product field. Preferably, the image is printed with a laser printer or inkjet printer (or other conventional printer technology, such as die sublimation printer). The storage device can store sound digitally or in analog form in different embodiments, and may also store further data associated with the image and sound (possibly a version of the image itself).

The electronic storage device is advantageously an integrated circuit formed on a substrate, preferably a flexible substrate so that the attachment is robust. The substrate may advantageouly be mounted within a recess formed on the printed image.

In a specific aspect of the invention, the substrate may be removably attachable to the printed image: advantageously, mounted on a clip for selective retention of the printed image.

In a further aspect, the invention provides a printer, comprising: means for receiving information defining a visual image, and adapted to render the visual image as a printed image; and means for receiving information defining a passage of sound, and adapted to store said information in an electronic storage device.

In a still further aspect, the invention provides a system for recording sound and related images, comprising: a camera adapted to record still images as image information and to record passages of sound, each associated with a still image, as sound information; a printer as indicated above; and information processing means to receive said image information and sound information from the camera and to provide said image information and sound information to the printer.

In a yet further aspect, the invention provides a sound storage device comprising: an electronic storage device adapted to store information defining a passage of sound; a substrate on which the electronic storage device is mounted; and means for selective engagement with an object. This allows for selective addition of sound clips to existing physical documents, and to

straightforward accessing of sound from these sound clips.

Accordingly, the sound storage device is advantageously provided as part of a system for associating a passage of sound with an object, the system comprising a sound storage device as indicated above and additionally the following: a sound recording device, comprising means to provide a connection with the sound storage device to enable information representing a passage of soundto be stored in the electronic storage device; and a sound reproduction device, comprising means to provide a connection with the sound storage device to enable information stored in the electronic storage device to be transferred to the sound reproduction device, and means to convert the information received from the electronic storage device into the passage of sound;wherein the sound recording device and the sound reproduction devices are adapted to be detachable or otherwise remote from the printed image when no connection between the electronic storage device and the sound reproduction device is required.

Description of Drawings

Embodiments of the invention are described further below, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows the components for the process of recording, providing and playing passages of sound together with still images according to embodiments of the present invention;

Figures 2a and 2b show, in plan view (with detail) and side elevation respectively, the physical arrangement of an electronic storage device on to a printed image according to an embodiment of the invention;

Figures 3a and 3b show in plan view and side elevation respectively the mounting of an electronic storage device on to a flexible substrate to provide a device usable in the arrangement of Figure 2;

Figure 4 shows schematically the components required for playback of a passage of sound held

on an electronic storage medium as a digital signal in accordance with an embodiment of the invention;

Figure 5 shows schematically the components required for playback of a passage of sound held on an electronic storage medium as an analog signal in accordance with an embodiment of the invention;

Figure 6 shows a sound reproduction device for reproducing a passage of sound held on an electronic storage medium in accordance with an embodiment of the invention; and

Figures 7a, 7b and 7c show examples of electronic storage media which are removably attachable to printed images, in accordance with certain embodiments of the invention: Figure 7a shows a common rear face whereas Figure 7b shows a front view of a paperclip having Figure 7a as a rear face and Figure 7c shows a front view of an adhesive tab having Figure 7a as a rear face.

Specific Description of Preferred Embodiments

Basic components in a system for providing an image and related sound are shown in Figure 1. A camera 1 comprises conventional means for capturing a still image together with means for recording a passage of sound. Sound recording means are conventional: a microphone 101 and an automatic gain controller 102 (in digital embodiments, such as is specifically shown in Figure 1, an analog/digital converter 103 and a codec 106 are also required) - where playback is also available, a loudspeaker 105 (and, if digital, a digital/analog converter 104) must also be provided. Typically a memory 107 for storage of audio and image information will also be required.

It should be noted that although the term "image" is used here, it does not refer merely to a pictorial image. It may also relate to, for example, text captured in an image format. Likewise, when the term "camera" is used, other devices for capturing a still image (such as a scanner) can be understood to fall within its scope in the context of the present invention.

Alternatively, sound can be added separately from capture of the image (eg in later annotation) and thus facility for sound capture need not be provided at the camera 1 in order to achieve certain aspects of the invention. However, provision of sound capture at the camera 1 is desirable as it enables modes of use to be employed that certain users find to be of particular value, such as the capture of ambient sound associated with the capture of a particular still image (e.g. associated conversation, or sounds associated with the photograph location). It also allows for annotation *in situ* on capture of the image.

This process of image and sound capture may be entirely analog, in which case both an analog image recording medium (such as film) and an analog sound recording medium are provided at the camera. Either at the camera 1, or separately, the analog image is printed (or rendered in some other tangible form) and the passage of sound is stored in an electronic storage device attached to the printed image.

Alternatively, image and sound capture may be entirely digital, with both image and sound digitized on capture and stored in an appropriate storage medium (for example on an Iomega "Clik" disk ("Clik" is a trade mark of Iomega Corporation)). In this event, the digital data can be provided to a digital processing means (such as personal computer 2). This is advantageous, as it allows for easy editing of both image and sound data. The image data can then be provided from the digital processing means as a printed image, and the passage of sound attached thereto in a digital electronic storage medium, such as a flash memory. This is best achieved by means of a printer 3. In printer 3, the image is printed in conventional manner and a sound reproduction device with the passage of sound recorded thereon is attached to the image. Advantageously, recording and attachment of sound is done in the printer itself, but this step may be carried out separately (for example, at the sound recording device 4, as is described further below). Alternatively, it is possible in some embodiments for the image data and optionally the sound data to be provided directly from the camera to the printer (for example by infra red data transfer using technologies currently known for infra red printing from personal computers - such as under the IrTranP standard): these arrangements may require the processor in camera 1 to be provided with a printer driver for the appropriate

printer.

Alternatively, the processes followed may be part analog and part digital (for example, digital sound recording but analog image production, with the electronic storage medium with sound stored therein attached in due course to the analog- produced image).

In each case, the result is a tangible representation of the image with an electronic storage medium having the passage of sound recorded thereon attached to it: this is here termed an "audioprint". To play the passage of sound, sound reproduction device 4 is employed. This can be connected to the electronic storage medium to enable information stored in the electronic storage device to be transferred to the sound reproduction device, the sound reproduction device 4 containing means to convert the information received from the electronic storage device into the passage of sound. However, sound reproduction device 4 is adapted to be detachable or otherwise remote from the printed image when no connection between the electronic storage device and the sound reproduction device is required.

Not shown in Figure 1 is the tangible image and the electronic storage medium. This is illustrated in Figures 2a and 2b. Figure 2a shows an image 11 in a tangible form: in this case a printed image. Attached to the image 11 is an electronic storage device 12. The electronic storage device comprises in this case a die 16 containing a memory (which may be for example a flash memory, or another form of EEPROM or PROM) in which the passage of sound is recorded, the die 16 being connected by tracks to connectors 15. The die 16, the tracks and the connectors 15 are all mounted on a flexible substrate 14, the flexible substrate being a membrane, advantageously of a plastics material.

Figure 2b shows one particularly advantageous arrangement for reproducible location of the electronic storage device 12 with respect to the tangible image 11. This is for the image 11 to be printed on paper 17 provided with a recess 13. A particularly appropriate form for the recess is as a slot at the edge of the paper sheet with a depth roughly equal to the thickness of the storage device. This leaves the resulting image 11 in a form which is particularly easy to handle (no more difficult than a conventional photographic print, or a sheet of paper).

The construction of a particularly suitable electronic storage device, here termed an audiotab, is shown in Figure 3a. Die 16 contains a memory device - advantageously a flash memory or other non-volatile EEPROM, though another form of PROM could provide a suitable alternative. As shown in Figure 3b, die 16 is fixed to the flexible substrate 14 by a number of solder bumps 18 to establish electrical connection between the die 16 and the conducting tracks on the substrate 14, and an insulating material is provided as a fill 19 to bind the die 16 into a common structure with the substrate 14. As previously indicated, it is desirable for the substrate 14 to be flexible: it is desirable that the substrate is at least of comparable flexibility to the printed image 11, otherwise the chance of the electronic storage device becoming detached increases significantly and the printed image will become more difficult to handle.

In the embodiment shown, connections to the audiotab are made by contact with a device (generally the sound reproduction device) abutting the edge of the printed image 11 in some way. Other forms of connection are quite possible. For example, connection could be made by surface contact, rather than by an edge connection of this type. Alternatively, signals and power could be transmitted without direct contact (signals by a variety of means, power typically by induction). It should also be noted that although connections to the audiotab for both signal and power are provided together (in preferred embodiments the audiotab will have no source of power itself, but will draw power from a device accessing it), this is not a necessary feature of the invention, and the two could be provided through different connectors, for example.

Each element of a preferred embodiment of the system here described will now be discussed in greater detail, both with regard to its construction and to its function. Information flow between elements of the system is also discussed. There are a number of particularly advantageous design options associated with the different elements of the system, some of these options being appropriate to certain overall uses of the system or components of the system, and some to others. These options are described with regard to the system element to which they relate, and where appropriate will be further described in the context of modified systems discussed further below which exhibit further aspects of the invention.

The camera 1 is adapted in different embodiments of the invention to capture images in various different, but conventional, ways. In preferred embodiments, the image will be captured and stored as a digital representation as in a conventional digital camera. However, embodiments are also available where the image is prepared by an analog route - in which case the image may be recorded on to conventional photographic film, or produced as an instant printed image (Land camera). In such analog embodiments, sound is handled separately, and image and sound information take different processing routes until the tangible image and the electronic storage device are assembled together.

Where camera 1 differs from a conventional camera is that it also contains means for recording a passage of sound. This feature is known from and discussed in various of the prior art documents mentioned earlier in the application. Essentially all that is required is that a microphone 101 and a sound recording apparatus are provided, with certain basic controls and displays: means to start and stop recording and to associate a specific recording with a specific image, and preferably means to display when a given recording is in progress and means for sound playback. Optional features are that recording could be synchronised with taking of a picture (starting or stopping at the point of image capture, or with image capture occurring at a predefined point during sound capture) - other conventional sound recording features (stereo, noise reduction etc.) may also be provided.

Advantageously, sound is recorded digitally and held in an appropriate storage medium. In preferred embodiments, both sound and images are recorded on the same digital storage medium (for such digital storage an Iomega "Clik" disk would be an appropriate choice), but in alternative embodiments sound and image can be handled through separate media (for example, if the image is recorded on film). Alternatively, the electronic storage medium for attachment to the tangible image could be recorded directly at the camera: this would be appropriate for a Land camera embodiment, for example. Discussion of recording on to an appropriate electronic storage medium will be discussed further at a later point.

In addition to recording capability, the camera 1 may also have the function of a sound

playback device capable of reproducing sound from the information stored in the electronic storage medium attached to the tangible image. Again, the necessary functionality is indicated below in the discussion of sound playback device 4.

For digital image or sound data, the next stage is signal processing by a signal processing device, which in appropriate embodiments will be a personal computer 2. Again, substantially any conventional image processing software may be used for editing or otherwise processing a digital image: likewise, conventional software is available for editing or otherwise changing the associated passage of sound. Examples of appropriate conventional software are Creative Wave Studio, Studio M (a product of Gold Disk, Inc.) and Adobe Premiere.

The processed digital data in personal computer 2 can then be handled independently: the image can be sent to a printer 3, and the sound to a device for recording sound on to the chosen electronic storage medium, with consequent assembly (manual or otherwise) of the printed image and the electronic storage medium together. The audiotab recording could then take place in the sound reproduction device (discussed further below), by an attachment or peripheral to the personal computer 2, or by a separate storage appliance with the capacity to store sound clips and record audiotabs with the stored clips. Such a storage appliance could also comprise means to archive sound clips (and any further recorded information, such as images, and to provide means to recover on request sound clips and any related information from the storage appliance.

In particularly advantageous embodiments, the printer 3 has both the function of printing the image and of transferring the passage of sound on to the electronic storage medium. The printer is adapted to send image information to the printer for printing in conventional manner: however a way is also provided for the associated file containing the passage of sound to be provided too (this is easily accomplished by use of a file format with an extension for sound)). Before or after the image is printed, the sound file is also transmitted to the printer. Means are provided at the printer for recording the sound file on to the electronic storage medium. The mechanically simplest solution is to provide a discrete interface at the printer into which a blank sound storage device could be slotted, the storage device then being removed after

recording and mechanically fixed to the printed image (a separate fixing means could be provided at the printer, such as an embossing head, so that the printed image and the sound storage device could be fixed together by a user after each was, separately, produced). Alternatively, means could be provided whereby the printer could be loaded with a supply of blank sound storage devices, a single sound storage device being recorded with a passage of sound on printing of an associated printed image. A particularly preferred form of this arrangement includes automatic paper handling to hold the printed image and to fix the associated sound storage device on to the printed image: the image and attached sound are thus output from the printer 3 without manual intervention from the user.

In a particularly effective solution, a specific path is provided for sound storage device substrates in the printer mechanism. This path could be designed for single substrates, but a more efficient mechanism would be provided for substrates provided in cassette or bandlier form. The bandolier solution is effective for self-adhesive substrates, as it is straightforward then to use a substrate path in which the tape is peeled away, shortly prior to substrate attachment, to reveal the self-adhesive surface. The printer path could provide for indentation of the print medium before die attachment (alternatively, pre-indented paper for accommodation of audiotabs could be pre-loaded into the printer). The printer and substrate path then run together to an attachment point, at which both the print medium and audiotab substrate are held in position, then fixed together by appropriate mechanical action (e.g. pressed together under solenoid action).

The sound reproduction device 4 will now be described with reference to Figure 6. Sound reproduction device 4 has a slot 24 adapted to receive connectors 15 of the electronic storage device 12. This allows access to the memory in the electronic storage device, and hence to the passage of sound, by the sound reproduction device 4. The reproduction device has user operable switches: in the embodiment shown in Figure 6, there is a play/stop button 25 and a rewind button 26. Sound reproduction device 4 also comprises a loudspeaker. Further functional features normal in sound reproduction devices can also be provided: for example, a headphone/earpiece connection, a fast forward button and a volume control. Capability can also be provided for recording passages of sound on to the electronic storage device at the

sound reproduction device 4. The passage of sound recorded on to the electronic storage device can then be modified or replaced at the sound reproduction device 4. The circuitry necessary for sound reproduction device 4 is discussed further below together with associated features of the audiotab.

In different embodiments, sound is provided from the camera 1 directly to the sound reproduction device 4 (perhaps through a temporary storage on a different storage medium, or simply from a standard audio output), with the initial recording of sound on to the electronic storage device taking place at the sound reproduction device, either before or after the fixing of the electronic storage device to the printed image. Alternatively, this direct connection can be from the personal computer 2 to the sound reproduction device 4, with recording of the audiotab at the sound reproduction device 4. Sound can be processed in the personal computer 2 as indicated above with conventional software, and then sent to the sound reproduction device 4 for subsequent audiotab recording. Another variant that effectively combined features is for camera 1 and sound reproduction device 4 to be the same object: this is a practical approach as sound recording and playback capability are also present in the camera. Likewise, alternative embodiments employ personal computer 2, with appropriate peripheral circuitry, as sound reproduction device 4.

The circuitry of the electronic storage device and the sound reproduction device will now be described. Other circuitry, and programs, are essentially conventional and the man skilled in the art will be well aware of the choices that are available

A digital solution for sound reproduction from sound stored on the electronic storage device is shown in Figure 4. Die 16 of the electronic storage device 12 contains a non-volatile memory. In a preferred embodiment, electronic storage device 12 is a CMOS device having an on-chip oscillator, a high density flash memory storage array, a serial interface, a write buffer and an address decoder. The bondout pitch of die 16 is expanded by the tracks on the substrate 14 to provide a connector 15 which can readily interface with an appropriately matched connector 51 of the sound reproduction device 4. At this connector, a separate connection may be provided for every input and output required (signal, power) or

alternatively these may be combined with appropriate conventional additional circuitry (for example, the signal may be provided by modulation of the power connection, in which case a modulator/demodulator circuit is also required). The arrangement shown in Figure 4 shows direct access to the memory in die 16 by the sound reproduction device and direct playing of the sound recording device: an alternative solution is for appropriate means to be provided to first download some or all of the information stored in the memory on die 16 to a separate memory in the sound reproduction device 4 for fast access by the reproduction device. As the sound is recorded in digital form, it needs to pass through digital to analog converter 52 and normally an amplifier 53 and appropriate filtration and gain stages 54 before rendering as sound through loudspeaker 55 (or alternatively provided on headphone/line output 56). Functions such as play, stop, rewind and fast forward are provided by conventional circuitry from manual switches 57. Recording at the sound reproduction device requires additionally microphone input 59, an analog to digital converter 58 and means to write to the memory in die 16. A power source for the sound reproduction device 4 is also needed, though not shown here (this may be a battery, for example). No separate power source is required for the electronic storage device, as it does not need to draw power except when connected to the sound reproduction device, which provides the power. Sound compression and decompression can also be used to maximise storage efficiency: a separate stage for decompression of stored data can be provided before digital to analog conversion (and likewise after analog to digital conversion on recording) with conventional technology.

An analog sound storage solution is shown in Figure 5. The arrangement of Figure 5 is substantially similar to that of Figure 4, and equivalent components are given the same reference numbers and are not described further here. In the analog case, no digital to analog converter 52 (or analog to digital converter on recording) is required: only a buffer (not shown) is required before amplifer 53. An appropriate analog storage technology is the ChipCorder technology of Information Storage Devices, Inc. (ISD), which provides a true quantised multilevel representation of the sample per cell. In this case the electronic storage device 12 is preferably again a CMOS device with an on-chip oscillator and high density multilevel EEPROM (such as ChipCorder, discussed above) storage array; an antialiasing filter and a smoothing filter will also be required in the overall circuitry. Connection choices in

supply of power and signals can be as for the digital case.

A particularly useful development beyond the arrangements indicated above allows for further information beyond simply the passage of sound to be recorded in the memory on electronic storage device 12. Clearly, this is particularly appropriate where sound is stored digitally on electronic storage device 12. Such information could be entered and recorded at camera 1 (this may include information such as the time of recording) or may contain extensive annotation or other information provided at personal computer 2: such information may be provided as a text file, or in an appropriate file format. In particularly advantageous embodiments, the memory of the electronic storage device 12 is also recorded with a representation of the image to which it is (or is to be) attached - this enables the image to be recreated if, for example, the printed image is damaged. This could be, for example, the image represented as a GIF file. Provision of such additional information makes it strongly advantageous for sound reproduction device 4 to also contain a display (not shown). This display may be adapted to show some or all of the additional information recorded in the memory, possibly including a representation of the image itself.

In addition to stored sound permanently attached to an image, this approach to recording information can also be used for removable attachment of passages of sound to objects. An electronic storage device 212, substantially similar to electronic storage device 12 and having die 216 and connectors 215, can be provided as part of a clip 220, as shown in Figures 7a and 7c. Connectors 215 are available for sound information to be accessed from, and recorded to, the memory in die 216 by means of a sound reproduction device 4 in exactly the manner disclosed above. Different forms of removable attachment are shown - clip 220 has a conventional paperclip design, with storage device 212 on the rear face of central leg 221 of the clip 220. Alternatively, as shown in Figure 7b, storage device 212 is on the rear face of tab 230, of which the front face comprises adhesive material (preferably weakly adhesive, to allow re-use) and an alignment ridge 232 is provided to allow accurate location of a document edge. The sound information now need have no association with a specific image, but may be attached instead to a document - for example, as a note providing a brief summary of a document, or giving instructions as to how it should be handled or processed. Such clips

could readily be re-recorded and reused. The form factor employed would be appropriate to the intended use: for use with documents, the form factor could be that of a more or less conventional paperclip design such as clip 220, or a sheet of paper held with a weakly bonding glue such as tab 230: whereas for use with other objects, the electronic storage device could be provided on a magnetic base (for use as a fridge magnet, for example). As the skilled man will appreciate, a variety of form factors are available possessing the common feature of removable attachment to a target object. Again, the information provided may be more than a simple passage of sound: additional information such as time of recording or even a related image, video or data file may be added.

CLAIMS

1. System for presentation of an image and related sound, comprising:

a printed image;

an electronic storage device attached to the printed image and adapted to store information defining a passage of sound; and

a sound reproduction device, comprising means to provide a connection with the sound storage device to enable information stored in the electronic storage device to be transferred to the sound reproduction device, and means to convert the information received from the electronic storage device into the passage of sound;

wherein the sound reproduction device is adapted to be detachable or otherwise remote from the printed image when no connection between the electronic storage device and the sound reproduction device is required.

2. System as claimed in claim 1, wherein the printed image is an image printed by an inkjet printer.

3. System as claimed in claim 1, wherein the printed image is an image printed by a laser printer.

4. System as claimed in any previous claim, wherein the connection between the electronic storage device and the sound reproduction device is provided by abutment between conducting connections on each of the electronic storage device and the sound reproduction device, wherein means are provided to establish selective connection between the electronic storage device and the sound reproduction device to provide such abutment.

5. System as claimed in any preceding claim, wherein the electronic storage device is

adapted to store the passage of sound as digital data.

6. System as claimed in any of claims 1 to 4, wherein the electronic storage device is adapted to store the passage of sound as analog data.

7. System as claimed in any preceding claim, wherein the electronic storage device is further adapted to store information defining an image represented in the printed image.

8. System as claimed in any preceding claim, wherein the electronic storage device is further adapted to store additional information related to the image.

9. System as claimed in any preceding claim, wherein the electronic storage device comprises an integrated circuit chip formed on a substrate.

10. System as claimed in claim 9, wherein the electronic storage device comprises a die mounted on the substrate.

11. System as claimed in claim 9 or claim 10, wherein the electronic storage device is fixedly attached to the printed image.

12. System as claimed in claim 11, wherein the electronic storage device is mounted within a recess formed on the printed image.

13. System as claimed in any of claims 9 to 12, wherein the substrate is formed of a material of comparable or greater flexibility than the printed image.

14. System as claimed in claim 9, wherein the substrate is removably attachable to the printed image.

15. System as claimed in claim 14, wherein the substrate is mounted on a clip adapted for

selective retention of the printed image therein.

16. System as claimed in any preceding claim, wherein the sound reproduction device is also a camera.

17. System as claimed in any preceding claim, wherein the sound reproduction device is also adapted for recording of sound on to the electronic storage device.

18. System as claimed in any preceding claim, wherein the sound reproduction device is adapted to download the passage of sound from the electronic storage device to a memory in the sound reproduction device, wherein the passage of sound is reproduced from the downloaded version of the passage of sound.

19. A printer, comprising:

means for receiving information defining a visual image, and adapted to render the visual image as a printed image; and

means for receiving information defining a passage of sound, and adapted to store said information in an electronic storage device.

20. A printer as claimed in claim 19, further comprising means for attaching the electronic storage device to the printed image.

21. A printer as claimed in claim 19 or claim 20, wherein the means for receiving information defining a visual image is adapted to store further information in the electronic storage device.

22. A printer as claimed in claim 21, wherein said further information comprises information defining the visual image.

23. A printer as claimed in any of claims 19 to 22, wherein said electronic storage device

comprises an integrated circuit mounted on a substrate.

24. A printer as claimed in claim 23, wherein said means for attaching is adapted to fixedly attach the electronic storage device to the printed image.

25. A system for recording sound and related images, comprising:

a camera adapted to record still images as image information and to record passages of sound, each associated with a still image, as sound information;

a printer as claimed in any of claims 19 to 24; and

information processing means to receive said image information and sound information from the camera and to provide said image information and sound information to the printer.

26. A system as claimed in claim 25, wherein the information processing means is a personal computer.

27. A system as claimed in claim 25 or claim 26, wherein the information processing means comprises means to allow user modification of the image information.

28. A system as claimed in any of claims 25 to 27, wherein the information processing means comprises means to allow user modification of the sound information.

29. A sound storage device comprising:

an electronic storage device adapted to store information defining a passage of sound;

a substrate on which the electronic storage device is mounted; and

means for selective engagement with an object.

30. A sound storage device as claimed in claim 29, wherein the electronic storage device is adapted to store additional information.

31. A sound storage device as claimed in claim 29 or claim 30, wherein the object is a paper document.

32. A sound storage device as claimed in claim 31, wherein the means for selective engagement comprises a clip for retention of a paper document held therein.

33. A sound storage device as claimed in any of claims 29 to 32, wherein the electronic storage device comprises an integrated circuit.

34. A system associating a passage of sound with an object, comprising:

a sound storage device as claimed in any of claims 29 to 33;

a sound recording device, comprising means to provide a connection with the sound storage device to enable information representing a passage of soundto be stored in the electronic storage device; and

a sound reproduction device, comprising means to provide a connection with the sound storage device to enable information stored in the electronic storage device to be transferred to the sound reproduction device, and means to convert the information received from the electronic storage device into the passage of sound;

wherein the sound recording device and the sound reproduction devices are adapted to be detachable or otherwise remote from the printed image when no connection between the electronic storage device and the sound reproduction device is required.

35. A system as claimed in claim 34, where the sound recording device is also the sound reproduction device.

ABSTRACT

PROVISION OF IMAGE WITH RELATED SOUND

A passage of sound is attached to a still image by means of an electronic storage medium 12. The electronic storage medium 12 comprises a die 16 containing a non-volatile memory and a flexible substrate 14 with connectors 15. The connectors can be interfaces with a separate reader 4 which plays the passage of sound recorded in the electronic storage medium. Further information can be provided in the memory of the electronic storage medium: for example, a representation of the image itself or further infomation relating to the image.

(Figure 4)

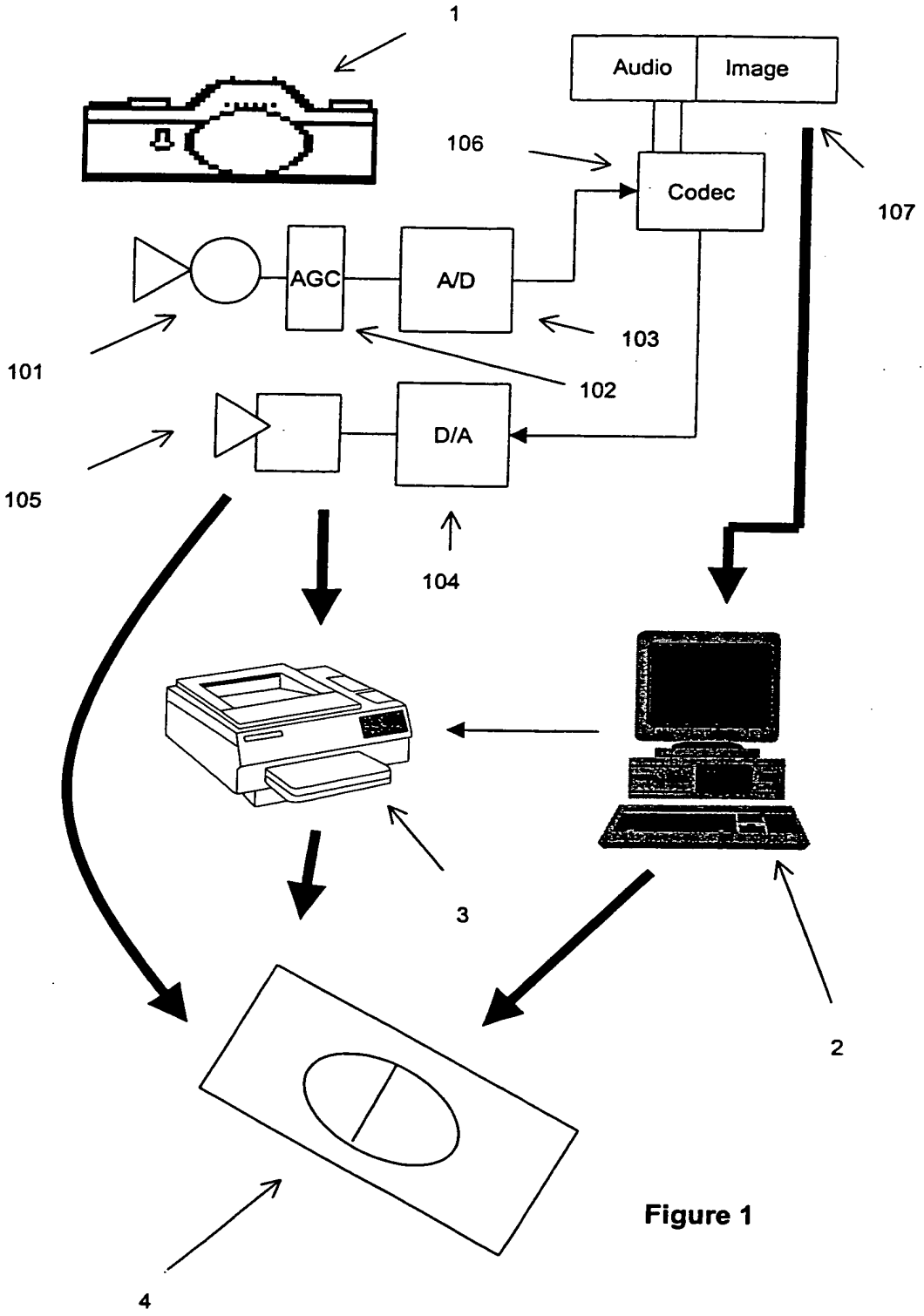

Figure 1

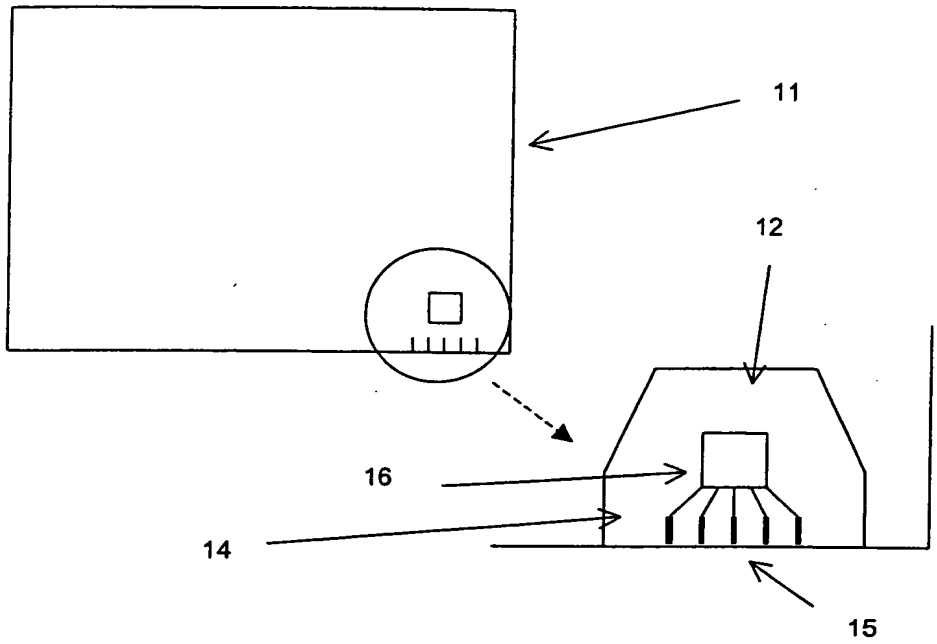

Figure 2a

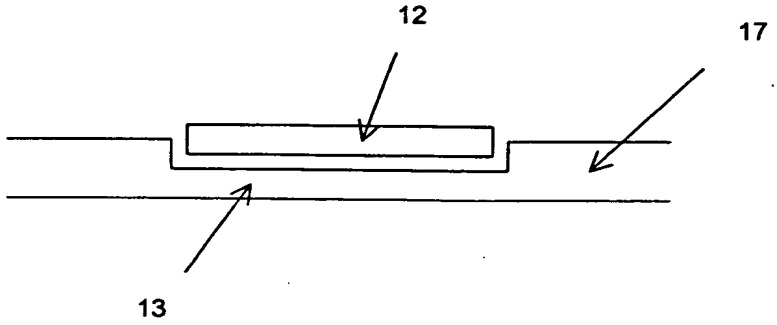

Figure 2b

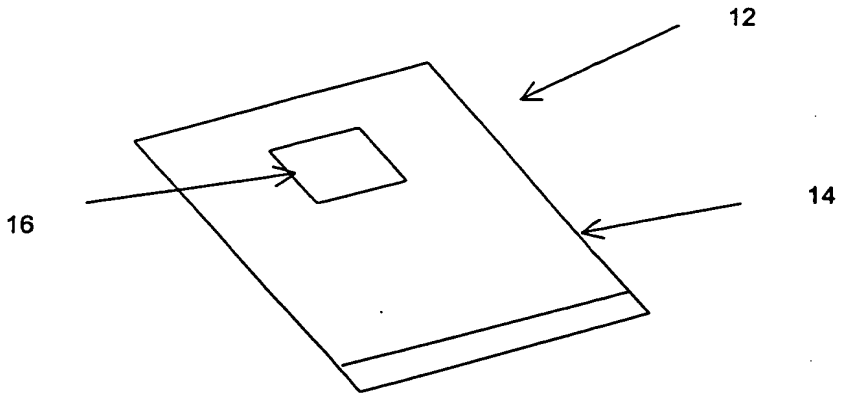

Figure 3a

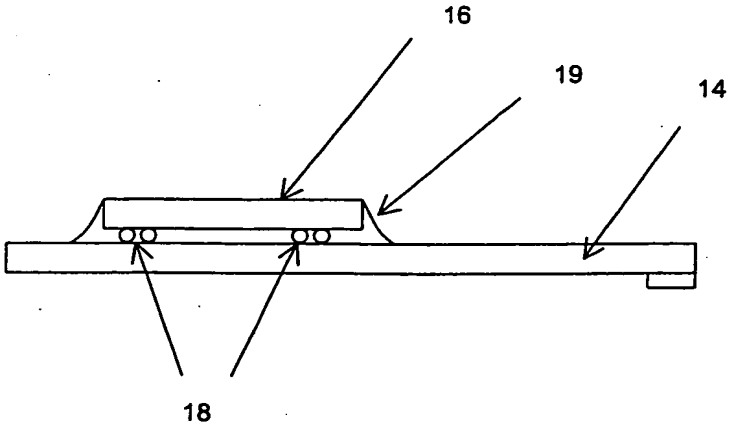

Figure 3b

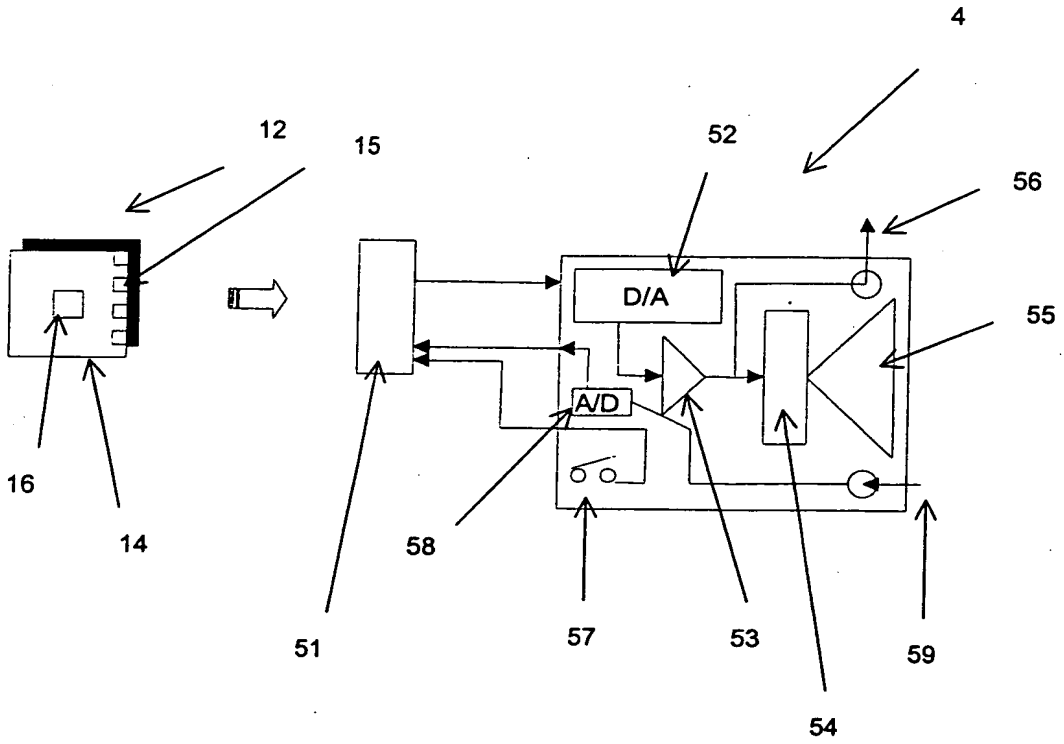

Figure 4

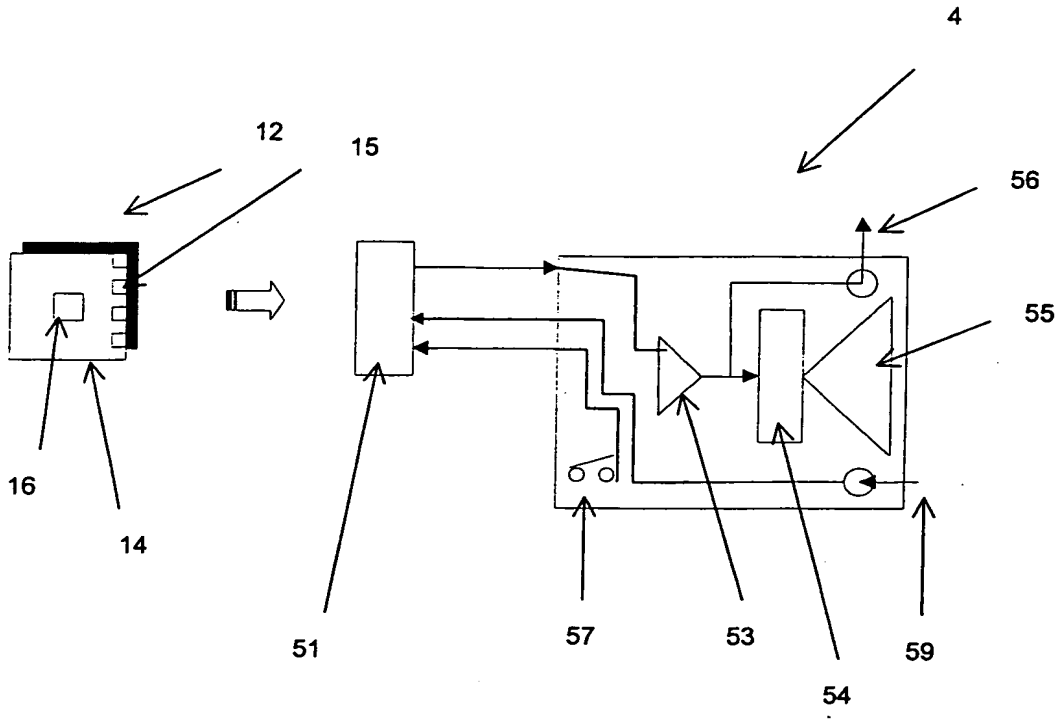

Figure 5

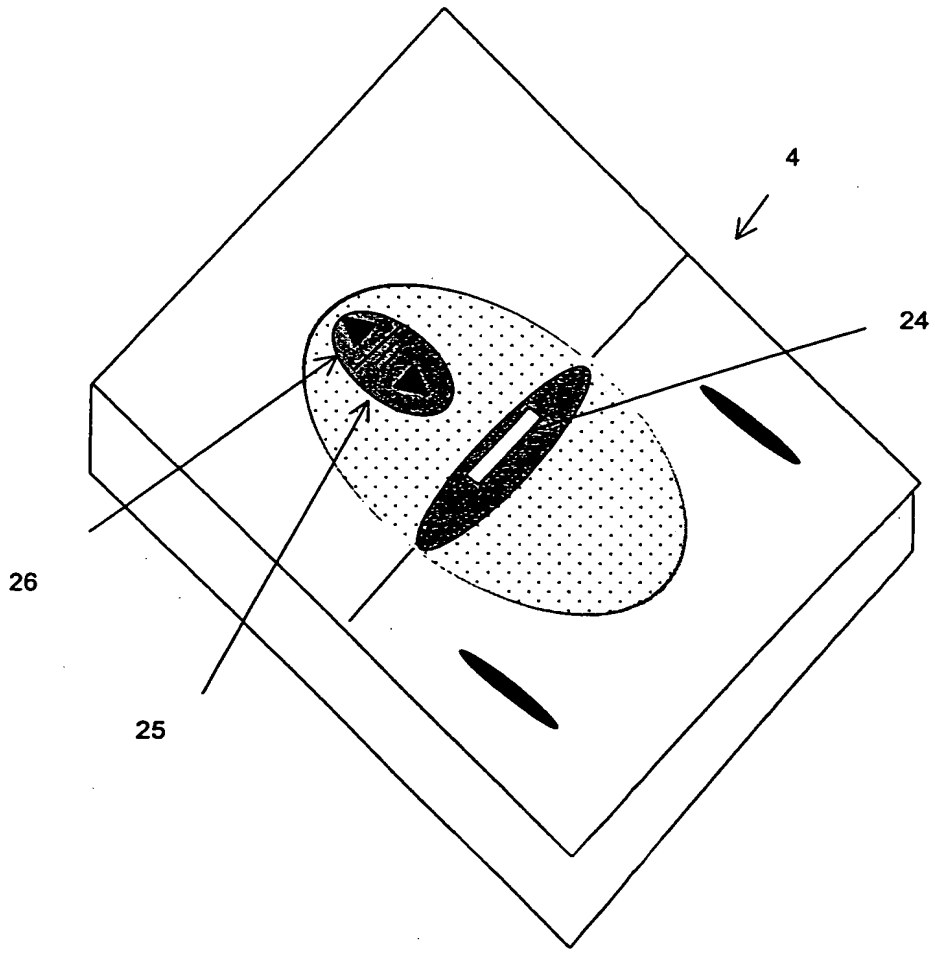

Figure 6

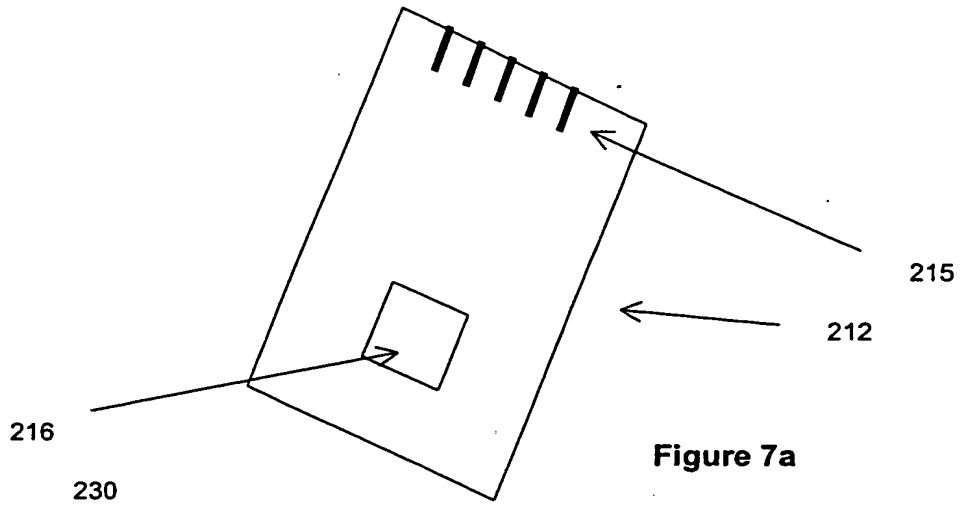

Figure 7a

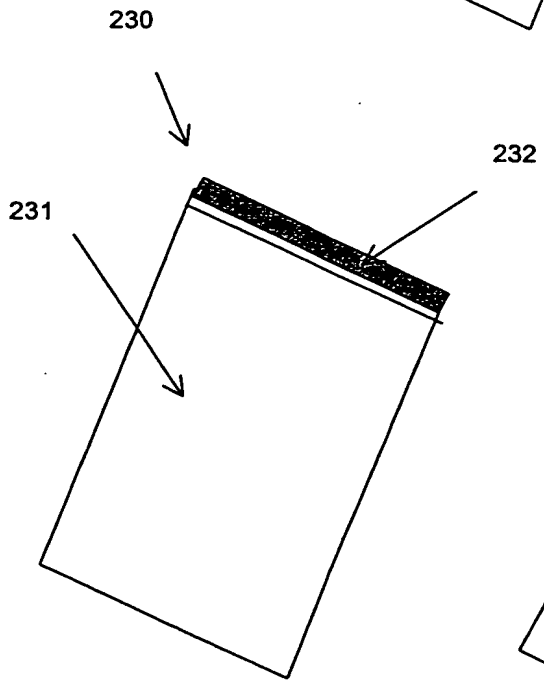

Figure 7b

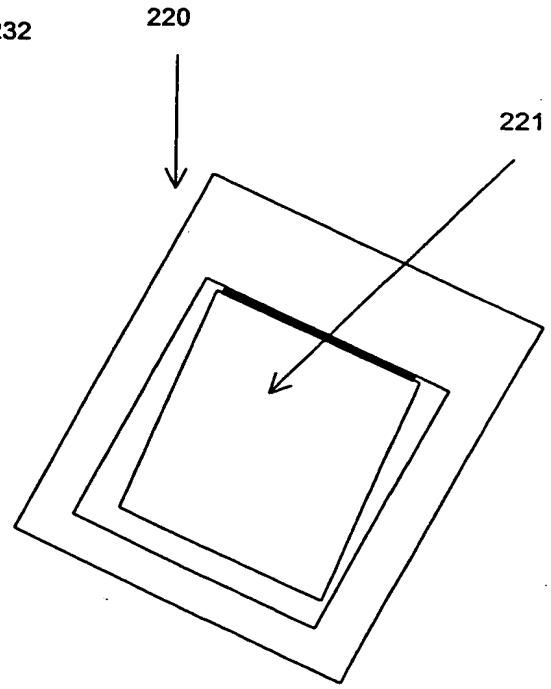

Figure 7c